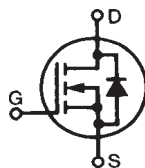


## Polar™ HiperFET™ Power MOSFET

## IXFH170N10P IXFK170N10P

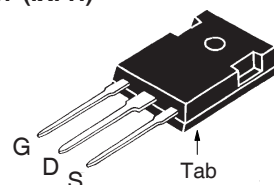
N-Channel Enhancement Mode  
Avalanche Rated  
Fast Intrinsic Rectifier



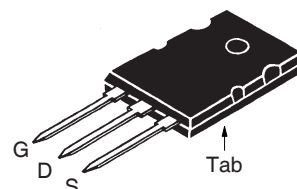
$$\begin{aligned} V_{DSS} &= 100V \\ I_{D25} &= 170A \\ R_{DS(on)} &\leq 9m\Omega \\ t_{rr} &\leq 150ns \end{aligned}$$

| Symbol       | Test Conditions                                                          | Maximum Ratings |                  |
|--------------|--------------------------------------------------------------------------|-----------------|------------------|
| $V_{DSS}$    | $T_J = 25^\circ\text{C}$ to $175^\circ\text{C}$                          | 100             | V                |
| $V_{DGR}$    | $T_J = 25^\circ\text{C}$ to $175^\circ\text{C}$ , $R_{GS} = 1M\Omega$    | 100             | V                |
| $V_{GSS}$    | Continuous                                                               | $\pm 20$        | V                |
| $V_{GSM}$    | Transient                                                                | $\pm 30$        | V                |
| $I_{D25}$    | $T_C = 25^\circ\text{C}$                                                 | 170             | A                |
| $I_{L(RMS)}$ | External Lead Current Limit                                              | 160             | A                |
| $I_{DM}$     | $T_C = 25^\circ\text{C}$ , Pulse Width Limited by $T_{JM}$               | 350             | A                |
| $I_A$        | $T_C = 25^\circ\text{C}$                                                 | 60              | A                |
| $E_{AS}$     | $T_C = 25^\circ\text{C}$                                                 | 2               | J                |
| $dv/dt$      | $I_S \leq I_{DM}$ , $V_{DD} \leq V_{DSS}$ , $T_J \leq 175^\circ\text{C}$ | 10              | V/ns             |
| $P_D$        | $T_C = 25^\circ\text{C}$                                                 | 715             | W                |
| $T_J$        |                                                                          | -55 to +175     | $^\circ\text{C}$ |
| $T_{JM}$     |                                                                          | +175            | $^\circ\text{C}$ |
| $T_{stg}$    |                                                                          | -55 to +175     | $^\circ\text{C}$ |
| $T_L$        | 1.6mm (0.063in) from Case for 10s                                        | 300             | $^\circ\text{C}$ |
| $T_{SOLD}$   | Plastic Body for 10s                                                     | 260             | $^\circ\text{C}$ |
| $M_d$        | Mounting Torque                                                          | 1.13/10         | Nm/lb.in.        |
| Weight       | TO-247                                                                   | 6               | g                |
|              | TO-264                                                                   | 10              | g                |

TO-247 (IXFH)



TO-264 (IXFK)



G = Gate      D = Drain  
S = Source    Tab = Drain

### Features

- International Standard Packages
- Fast Intrinsic Rectifier
- Avalanche Rated
- Low  $R_{DS(ON)}$  and  $Q_G$
- Low Package Inductance

### Advantages

- High Power Density
- Easy to Mount
- Space Savings

### Applications

- Switch-Mode and Resonant-Mode Power Supplies
- DC-DC Converters
- Laser Drivers
- AC and DC Motor Drives
- Robotics and Servo Controls

| Symbol       | Test Conditions<br>( $T_J = 25^\circ\text{C}$ , Unless Otherwise Specified) | Characteristic Values |      |              |
|--------------|-----------------------------------------------------------------------------|-----------------------|------|--------------|
|              |                                                                             | Min.                  | Typ. | Max.         |
| $BV_{DSS}$   | $V_{GS} = 0V$ , $I_D = 250\mu A$                                            | 100                   |      | V            |
| $V_{GS(th)}$ | $V_{DS} = V_{GS}$ , $I_D = 4mA$                                             | 2.5                   |      | 5.0 V        |
| $I_{GSS}$    | $V_{GS} = \pm 20V$ , $V_{DS} = 0V$                                          |                       |      | $\pm 100$ nA |
| $I_{DSS}$    | $V_{DS} = V_{DSS}$ , $V_{GS} = 0V$<br>$T_J = 150^\circ\text{C}$             |                       |      | 25 $\mu A$   |
|              |                                                                             |                       |      | 500 $\mu A$  |
| $R_{DS(on)}$ | $V_{GS} = 10V$ , $I_D = 0.5 \cdot I_{D25}$ , Note 1                         |                       |      | 9 m $\Omega$ |
|              | $V_{GS} = 15V$ , $I_D = 350A$                                               |                       | 7    | m $\Omega$   |

| Symbol       | Test Conditions                                                                                                                               | Characteristic Values |      |                         |
|--------------|-----------------------------------------------------------------------------------------------------------------------------------------------|-----------------------|------|-------------------------|
|              | ( $T_J = 25^\circ\text{C}$ , Unless Otherwise Specified)                                                                                      | Min.                  | Typ. | Max.                    |
| $g_{fs}$     | $V_{DS} = 10\text{V}$ , $I_D = 0.5 \cdot I_{D25}$ , Note 1                                                                                    | 50                    | 72   | S                       |
| $C_{iss}$    | $V_{GS} = 0\text{V}$ , $V_{DS} = 25\text{V}$ , $f = 1\text{MHz}$                                                                              |                       | 6000 | pF                      |
| $C_{oss}$    |                                                                                                                                               |                       | 2340 | pF                      |
| $C_{rss}$    |                                                                                                                                               |                       | 730  | pF                      |
| $t_{d(on)}$  | <b>Resistive Switching Times</b><br>$V_{GS} = 10\text{V}$ , $V_{DS} = 0.5 \cdot V_{DSS}$ , $I_D = 60\text{A}$<br>$R_G = 3.3\Omega$ (External) |                       | 35   | ns                      |
| $t_r$        |                                                                                                                                               |                       | 50   | ns                      |
| $t_{d(off)}$ |                                                                                                                                               |                       | 90   | ns                      |
| $t_f$        |                                                                                                                                               |                       | 33   | ns                      |
| $Q_{g(on)}$  | $V_{GS} = 10\text{V}$ , $V_{DS} = 0.5 \cdot V_{DSS}$ , $I_D = 0.5 \cdot I_{D25}$                                                              |                       | 198  | nC                      |
| $Q_{gs}$     |                                                                                                                                               |                       | 39   | nC                      |
| $Q_{gd}$     |                                                                                                                                               |                       | 107  | nC                      |
| $R_{thJC}$   |                                                                                                                                               |                       |      | 0.21 $^\circ\text{C/W}$ |
| $R_{thCS}$   | (TO-247)                                                                                                                                      | 0.21                  |      | $^\circ\text{C/W}$      |
|              | (TO-264)                                                                                                                                      | 0.15                  |      | $^\circ\text{C/W}$      |

## Source-Drain Diode

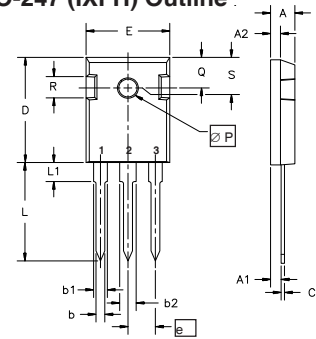
| Symbol   | Test Conditions                                                                                        | Characteristic Values |      |               |
|----------|--------------------------------------------------------------------------------------------------------|-----------------------|------|---------------|
|          | ( $T_J = 25^\circ\text{C}$ , Unless Otherwise Specified)                                               | Min.                  | Typ. | Max.          |
| $I_S$    | $V_{GS} = 0\text{V}$                                                                                   |                       |      | 170 A         |
| $I_{SM}$ | Repetitive, Pulse Width Limited by $T_{JM}$                                                            |                       |      | 350 A         |
| $V_{SD}$ | $I_F = I_S$ , $V_{GS} = 0\text{V}$ , Note 1                                                            |                       |      | 1.5 V         |
| $t_{rr}$ | $I_F = 25\text{A}$ , $-di/dt = 100\text{A}/\mu\text{s}$ ,<br>$V_R = 50\text{V}$ , $V_{GS} = 0\text{V}$ |                       | 8.0  | 150 ns        |
| $I_{RM}$ |                                                                                                        |                       | 0.6  | A             |
| $Q_{RM}$ |                                                                                                        |                       |      | $\mu\text{C}$ |

Note 1. Pulse test,  $t \leq 300\mu\text{s}$ , duty cycle,  $d \leq 2\%$ .

IXYS Reserves the Right to Change Limits, Test Conditions, and Dimensions.

|                                                                                  |           |           |           |           |              |              |              |              |              |             |
|----------------------------------------------------------------------------------|-----------|-----------|-----------|-----------|--------------|--------------|--------------|--------------|--------------|-------------|
| IXYS MOSFETs and IGBTs are covered by one or more of the following U.S. patents: | 4,835,592 | 4,931,844 | 5,049,961 | 5,237,481 | 6,162,665    | 6,404,065 B1 | 6,683,344    | 6,727,585    | 7,005,734 B2 | 7,157,338B2 |
|                                                                                  | 4,850,072 | 5,017,508 | 5,063,307 | 5,381,025 | 6,259,123 B1 | 6,534,343    | 6,710,405 B2 | 6,759,692    | 7,063,975 B2 |             |
|                                                                                  | 4,881,106 | 5,034,796 | 5,187,117 | 5,486,715 | 6,306,728 B1 | 6,583,505    | 6,710,463    | 6,771,478 B2 | 7,071,537    |             |

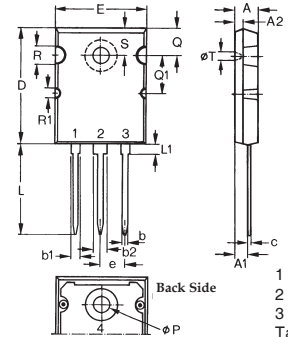
## TO-247 (IXFH) Outline



Terminals: 1 - Gate  
3 - Source  
2 - Drain  
Tab - Drain

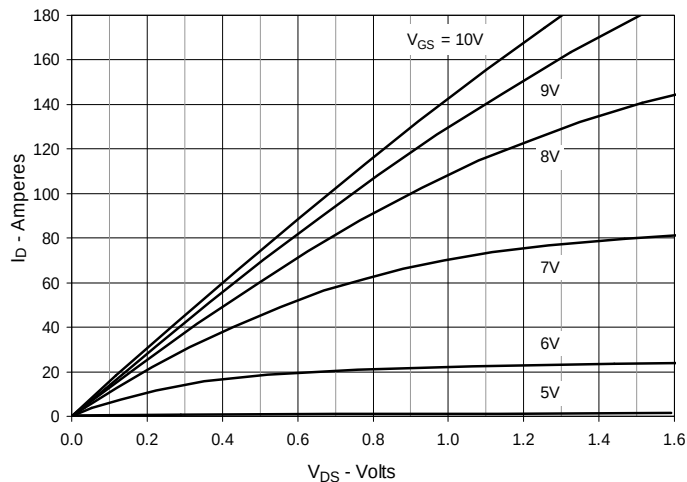
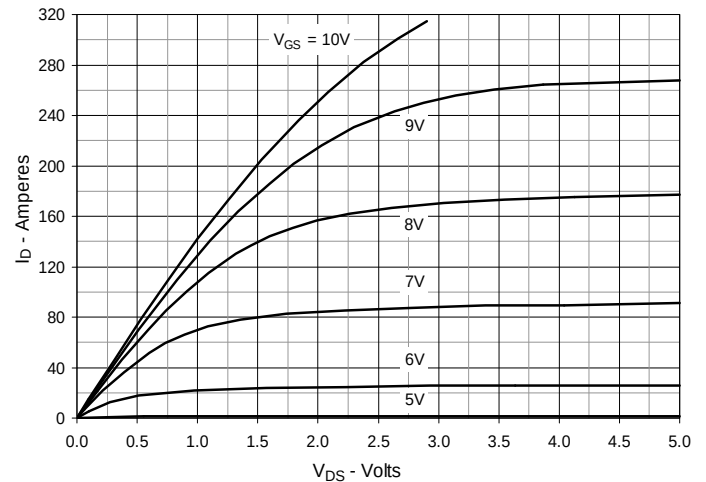
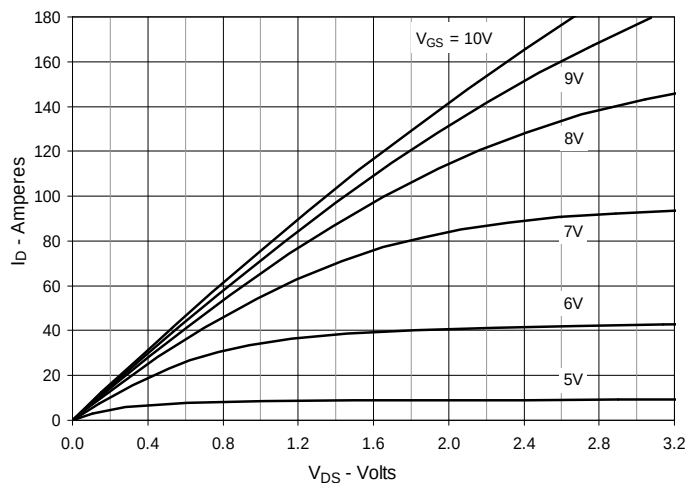
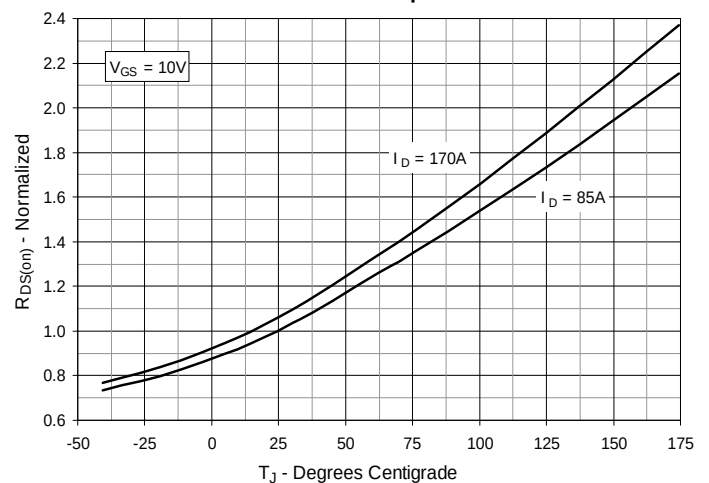
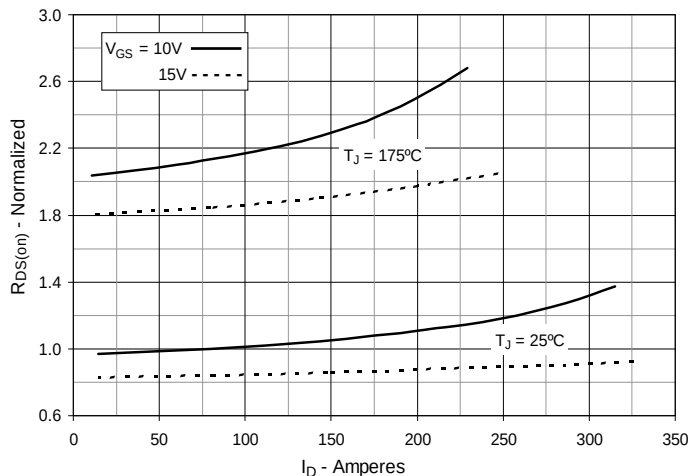
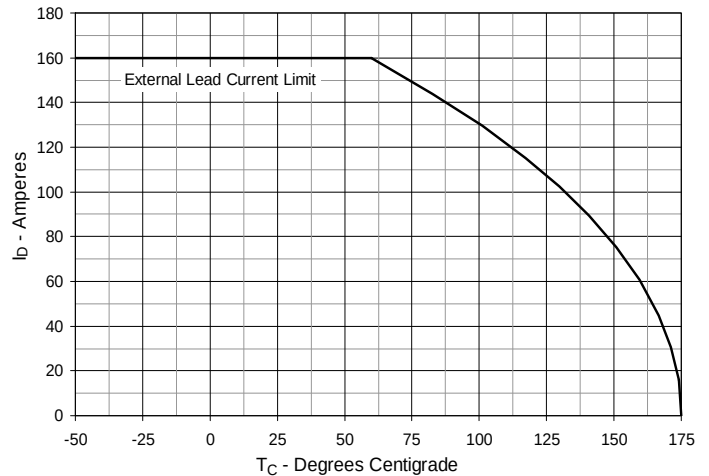
| Dim.           | Millimeter Min. | Millimeter Max. | Inches Min. | Inches Max. |
|----------------|-----------------|-----------------|-------------|-------------|
| A              | 4.7             | 5.3             | .185        | .209        |
| A <sub>1</sub> | 2.2             | 2.54            | .087        | .102        |
| A <sub>2</sub> | 2.2             | 2.6             | .059        | .098        |
| b              | 1.0             | 1.4             | .040        | .055        |
| b <sub>1</sub> | 1.65            | 2.13            | .065        | .084        |
| b <sub>2</sub> | 2.87            | 3.12            | .113        | .123        |
| C              | .4              | .8              | .016        | .031        |
| D              | 20.80           | 21.46           | .819        | .845        |
| E              | 15.75           | 16.26           | .610        | .640        |
| e              | 5.20            | 5.72            | 0.205       | 0.225       |
| L              | 19.81           | 20.32           | .780        | .800        |
| L1             |                 | 4.50            |             | .177        |
| ØP             | 3.55            | 3.65            | .140        | .144        |
| Q              | 5.89            | 6.40            | 0.232       | 0.252       |
| R              | 4.32            | 5.49            | .170        | .216        |
| S              | 6.15            | BSC             | .242        | BSC         |

## TO-264 AA (IXFK) Outline



1 = Gate  
2 = Drain  
3 = Source  
Tab = Drain

| Dim.           | Millimeter Min. | Millimeter Max. | Inches Min. | Inches Max. |
|----------------|-----------------|-----------------|-------------|-------------|
| A              | 4.82            | 5.13            | .190        | .202        |
| A <sub>1</sub> | 2.54            | 2.89            | .100        | .114        |
| A <sub>2</sub> | 2.00            | 2.10            | .079        | .083        |
| b              | 1.12            | 1.42            | .044        | .056        |
| b <sub>1</sub> | 2.39            | 2.69            | .094        | .106        |
| b <sub>2</sub> | 2.90            | 3.09            | .114        | .122        |
| c              | 0.53            | 0.83            | .021        | .033        |
| D              | 25.91           | 26.16           | 1.020       | 1.030       |
| E              | 19.81           | 19.96           | .780        | .786        |
| e              | 5.46            | BSC             | .215        | BSC         |
| J              | 0.00            | 0.25            | .000        | .010        |
| K              | 0.00            | 0.25            | .000        | .010        |
| L              | 20.32           | 20.83           | .800        | .820        |
| L1             | 2.29            | 2.59            | .090        | .102        |
| P              | 3.17            | 3.66            | .125        | .144        |
| Q              | 6.07            | 6.27            | .239        | .247        |
| Q1             | 8.38            | 8.69            | .330        | .342        |
| R              | 3.81            | 4.32            | .150        | .170        |
| R1             | 1.78            | 2.29            | .070        | .090        |
| S              | 6.04            | 6.30            | .238        | .248        |
| T              | 1.57            | 1.83            | .062        | .072        |

**Fig. 1. Output Characteristics @  $T_J = 25^\circ\text{C}$** 

**Fig. 2. Extended Output Characteristics @  $T_J = 25^\circ\text{C}$** 

**Fig. 3. Output Characteristics @  $T_J = 150^\circ\text{C}$** 

**Fig. 4.  $R_{DS(on)}$  Normalized to  $I_D = 85\text{A}$  Value vs. Junction Temperature**

**Fig. 5.  $R_{DS(on)}$  Normalized to  $I_D = 85\text{A}$  Value vs. Drain Current**

**Fig. 6. Maximum Drain Current vs. Case Temperature**


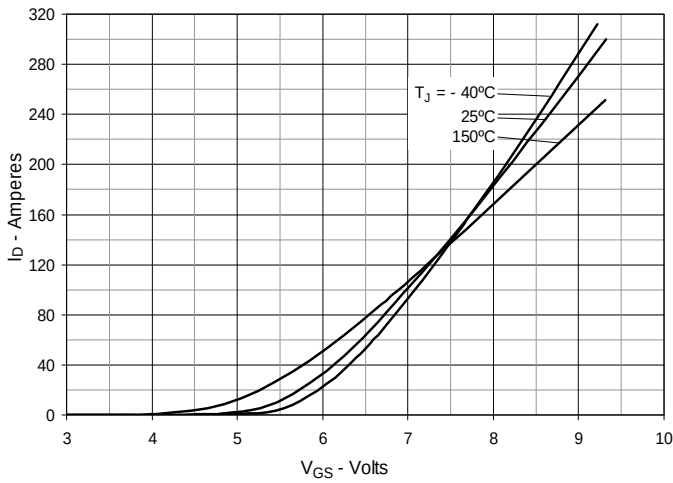
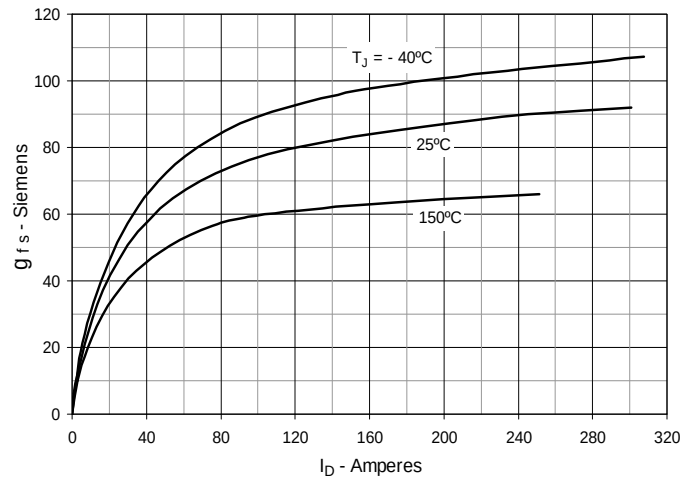
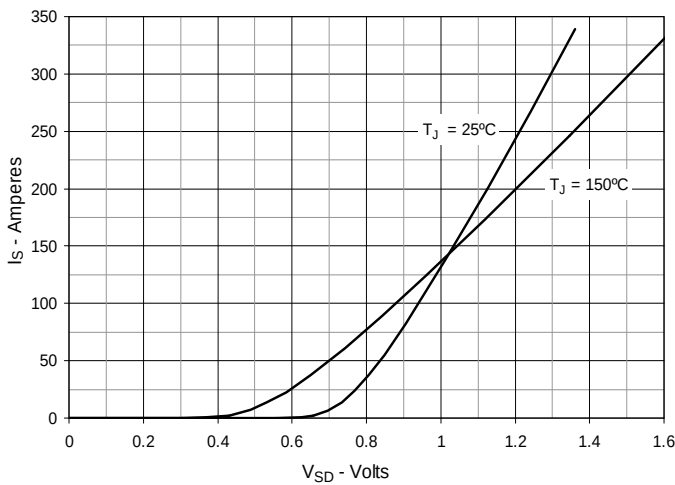
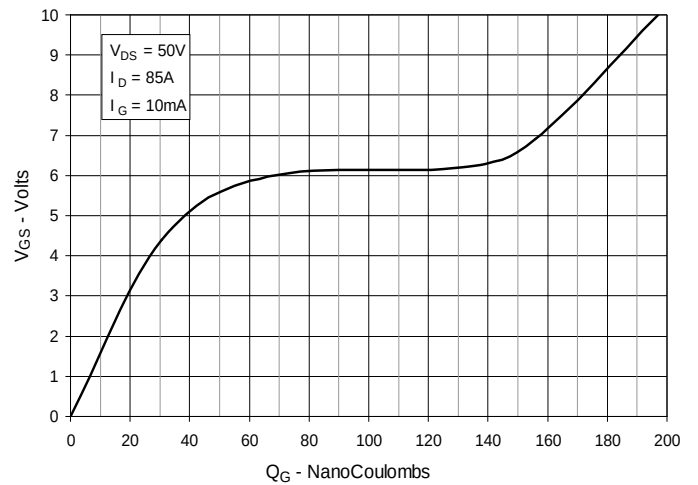
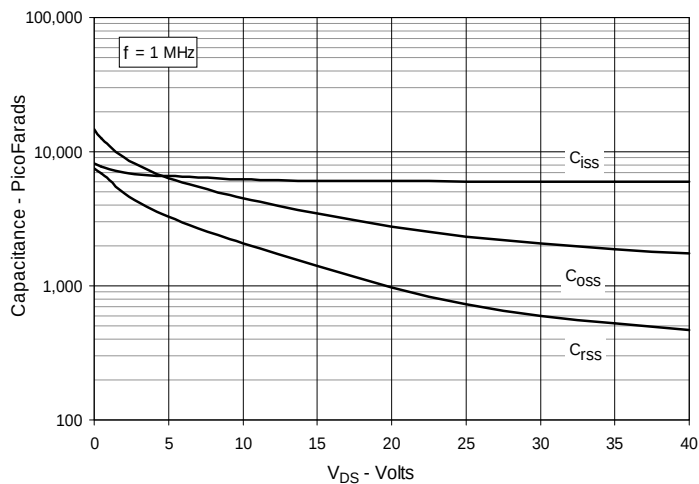
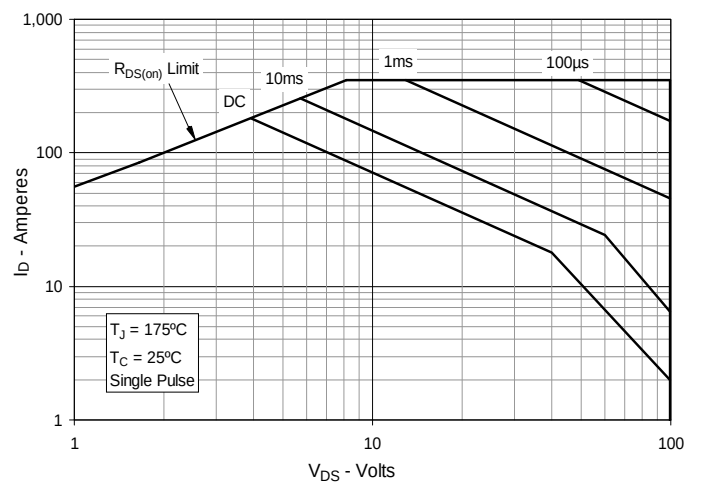
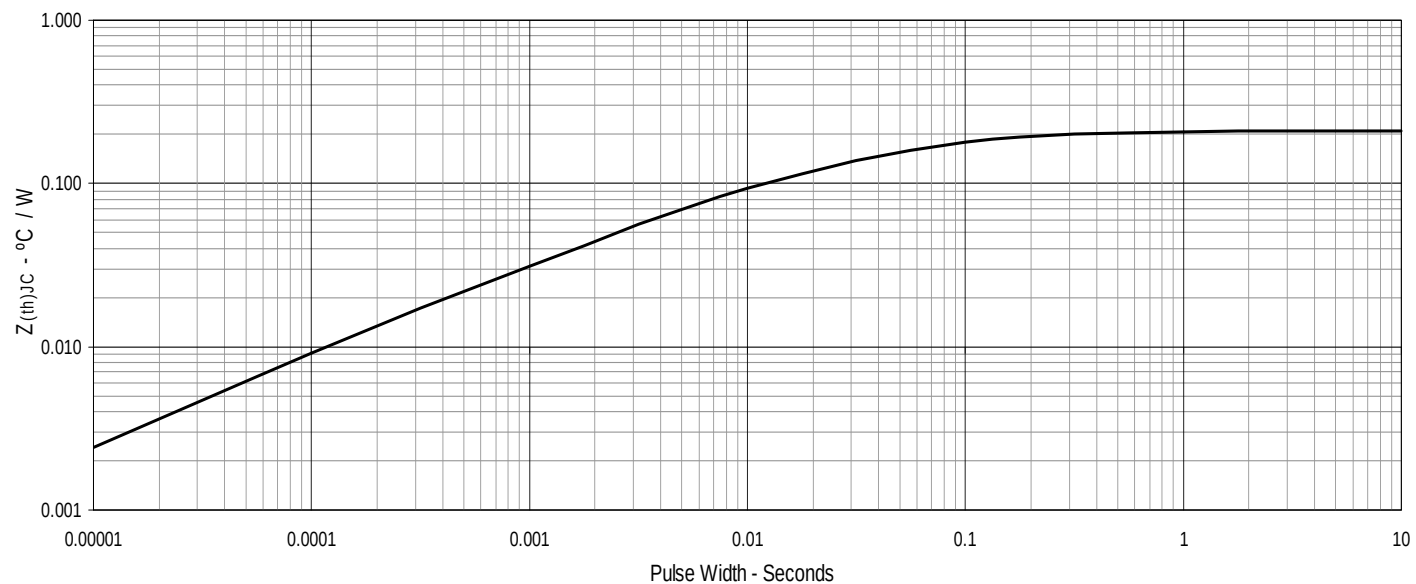
**Fig. 7. Input Admittance**

**Fig. 8. Transconductance**

**Fig. 9. Forward Voltage Drop of Intrinsic Diode**

**Fig. 10. Gate Charge**

**Fig. 11. Capacitance**

**Fig. 12. Forward-Bias Safe Operating Area**


Fig. 13. Maximum Transient Thermal Impedance





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